MATH 281 (PHILLIPS), FALL 2020: WRITTEN HOMEWORK 5

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This homework assignment is due Friday 6 Nov. 2020 at 10:00 pm, to be uploaded as a pdf file (or one of a few other allowed file types) on the University of Oregon Canvas site.

General instructions: show work in all problems, and be very careful to use fully correct notation. Incorrect notation will lose credit on exams (grading is based on what you write, not what you meant), and the written homework assignments are your chance to have me tell you whether your notation is correct.

Files turned in must have good enough resolution that I can read them easily.

Apart from the extension (such as "`.pdf`"), your file name should contain only numbers, capital and lowercase letters, and underscores. In particular, **no** spaces or parentheses. You do not need to put any identifying information in the file name; "`HW5.pdf`" is quite sufficient. (The Canvas system adds enough identifying information.)

Write your name on all pages.

Problem 1 (9 points)**.** For the surface

$$\frac{(x-4)^2}{9} + \frac{y^2}{16} + z^2 = 1,$$

find and draw the trace in the xy plane, the trace in the plane $x = 0$, and the trace in the plane $y = \sqrt{7}$. In your graphs, be sure to label the axes and put scales on the axes. Traces are in planes, so draw just the graph in a plane; don't try to locate it in space in your picture.

(Before doing this problem, read the list of common mistakes on Problem 1 on Written Homework 4.)

Problem 2 (10 points)**.** The position of a drone flying over part of Corvallis at time t (measured in minutes) is given by

$$\mathbf{r}(t) = \big\langle 6t + 24,\ -th(t),\ h(t) + 5 \big\rangle$$

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(measured in meters) for some real valued function h for which you know that

$$h(0) = 11, \qquad h'(0) = 6, \qquad h''(0) = 3, \qquad h'''(0) = 7,$$
$$h(4) = 2, \qquad h'(4) = -3, \qquad h''(4) = 5, \qquad \text{and} \qquad h'''(4) = 1.$$

Find the velocity of the drone at time t (your answer will involve h and its derivatives), the speed of the drone at time 4, and the acceleration of the drone at time 4. Was the drone going up, down, or neither at time 4? Why? (Assume a standard orientation of the coordinate axes.) You will not need to use all the information provided.

Problem 3 (6 points)**.** Let g be a continuous real valued function defined on $\mathbb{R}$ such that $g(0) = 11$ and $g(1) = -3$. Find, with justification,

$$\lim_{(x,y)\to(0,0)} \big(2g(x) - g(x+y+1)\big).$$